Nota Lepi. **45** 2022: 169–190 | DOI 10.3897/nl.45.78574 Research Article

Taxonomic notes on Palearctic taxa of Galacticidae, a little-known family of Lepidoptera (Galacticoidea)

Wolfram Mey[1]

1 *Museum für Naturkunde, Leibniz Institute of Evolution and Biodiversity Research, Invalidenstr. 43, 10115 Berlin, Germany; wolfram.mey@mfn.de*

http://zoobank.org/23C83728-C2BD-47A7-BEF2-519AE8B1B42E

Received 28 November 2021; accepted 14 March 2022; published: 18 April 2022
Subject Editor: Lauri Kaila.

Abstract. Galacticidae is a poorly known family in the Palearctic Region. The range of the family covers the Mediterranean Zone of North Africa, as well as Western Asia, Eastern Russia, Central Asia and the Eastern Palaearctic. The included taxa are summarised in a checklist. Available type material was examined and redescriptions of some species are provided. Two genera are recognised and diagnosed: *Homadaula* Lower, 1899 with four species and *Zarcinia* Chrétien, 1915 with five species. *Bahrlutia* Amsel 1935, **syn. nov.** is a junior synonym of *Zarcinia* and *Galactica* Walsingham, 1911 **syn. nov**., the name bearing type genus of the family, proves to be a junior synonym of *Homadaula*. The male and female genitalia are the principal characters for defining genera and diagnosing species in this family. The hitherto unknown genitalia of seven species are illustrated for the first time. *Zarcinia stshetkini* **sp. nov.** is described from Tajikistan and Afghanistan. Not all taxonomic problems could be solved. Three species remain as *incertae sedis*.

Introduction

The family Galacticidae was established by Minet (1986) on the basis of morphological descriptions by Clarke (1943) and Inoue et al. (1982), and by a proposal of Friese (1966). It was again recognised as a separate family by Kyrki (1990) by upgrading the *Homadaula* Group sensu Kyrki (1984), but without discussing taxonomic evidence. Four genera were included in the family: *Homadaula* Lower, 1899, *Zarcinia* Chrétien, 1915, *Bahrluthia* Amsel,1935, and *Galactica* Walsingham, 1911, with the latter as the type genus. Valid autapomorphies of the family were provided by Dugdale et al. (1998) who established the superfamily Galacticoidea. Autapomorphies were recognised as genital modifications in both sexes exemplified by Australian species of *Homadaula*:

- male tergum VIII forming a hood over segments IX and X which are deeply incorporated within segment VIII,
- female genitalia with genital opening on a penis-like tube projecting from membrane between segments VII and VIII.

The taxonomy of the family has not been revised until now. In the past, the genera were introduced without descriptions of the genitalia, which subsequently turned out to be the most significant features in the discrimination of taxa. Mey (2004) provided a synopsis of nominal genera and

Copyright *Wolfram Mey*. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

species and their type localities in Africa and in the Western Palaearctic Region.One Central Asian species, then *Galactica walsinghami* Caradja, 1920, reaches the European area in Eastern and South-eastern Russia (= Dagestan). The species and the family were not included in Karsholt and Razowski (1996) and thus escaped recognition as a European family for some time.

The oldest generic name in the family is *Homadaula* Lower, 1899, whose description is based on *H. lasiochroa* Lower, 1899 from Australia. Clarke (1967) provided an initial list of galacticid species demonstrating the Old-World distribution of the genus with three species occurring in Asia, one species in Africa and three species in Australia at that time. The single continental African species was examined by Mey (2004), who concomitantly provided the descriptions of two additional species from Southern Africa. Five further species from Africa south of the Sahara and from the Arabian Peninsula were published subsequently (Mey 2007, 2011).

The genus *Galactica* Walsingham, 1911 was established with the description of *G. caradjae* collected in Algeria. Caradja (1920) repaid the compliment by describing a species from North Kazakhstan as *G. walsinghami* Caradja, 1920, together with the variety (ab. = aberration) *pluripunctella* Caradja, 1920.

The genus *Zarcinia* Chrétien, 1915 was established with the description of *Z. nigrosignatella* Chrétien, 1915. The species was collected in the south of Tunisia. The number and sex of the type specimens were not stated. Two more species were added subsequently to this genus by Meyrick (1917, 1925).

The genus *Bahrlutia* Amsel, 1935 was introduced based on characters of the wing venation, which were regarded as different from *Zarcinia*. The type species, *B. ghorella* Amsel, 1935, was collected in Palestine (= today Israel). Later, Amsel described a second species of the genus, *B. schaeuffelei* Amsel, 1959 on the basis of two females collected in Iran. Each of the four genera were originally described in Yponomeutidae, but were excluded from this family by Friese (1962) who later proposed Plutellidae as a better placement (Friese 1966).

In the Microlepidoptera collection of the Russian lepidopterist Y.L. Stshetkin, which is deposited in the Museum für Naturkunde, Berlin (MfN), a small series of a galacticid species from Tajikistan was found. During a visit by the author to the Naturhistorisches Museum, Wien in 2005, further material of the family was detected and borrowed from the accessions of the Lepidoptera collection. Due to other, more urgent projects, the amassed material unfortunately remained unstudied. After 16 years, I resumed my studies on Palaearctic Galacticidae. It became again apparent that the basis for a taxonomic revision is still limited and only a few specimens have been added since. The types of four species could not be revised, which are treated here as *incertae sedis*. Despite this weak basis, I decided to embark into a study with the aim of clarifying the status of species and genera of Galacticidae in the Palaearctic Region with the material at hand. The family is little known among European lepidopterists and I hope this study will attract the attention of other students to this family, which is still poorly researched systematically and biogeographically, especially in northern Africa and Asia.

Materials and methods

Adults examined included type specimens as well as non-type specimens from private collections and museums that are listed at the end of the chapter. Pinned specimens and their associated slide-mounted genitalia, as well as other features, were examined with dissecting and compound microscopes.

Dissection of the genitalia was performed according to the procedure described by Robinson (1976). The genitalia were embedded in Euparal. Chlorazol Black was used for staining female genitalia. The cleared abdomens of some non-type specimens are on the corresponding pins in polyethylene vials with glycerin. Prior to embedding the cleared genitalia on microscope slides or into glycerin vials, they were drawn using a camera lucida attached to a Leica MZ12 compound microscope.

The terminology used in the descriptions of species largely follows Mey (2004). The treatment and sequence of the genera and species are arranged alphabetically.

As explained in the introduction, this article is not designed as a revision in its proper sense. Therefore, the species are not described according to a fixed scheme but are treated in a way providing mainly new faunistic records, references and hitherto unknown details.

Abbreviation of depositories of type material

NHMUK	Museum of Natural History, London, Great Britain; formerly British Museum of Natural History (BMNH)
DEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg. Germany
MfN	Museum für Naturkunde, Berlin, Germany
MNHN	Musée Nationale de Histoire Naturelle, Paris, France
MGAB	Museum de Istoria Naturala "Grigore Antipa", Bucharest, Romania
NHMW	Naturhistorisches Museum, Wien, Austria
SMNK	Staatliches Museum für Naturkunde, Karlsruhe, Germany
SMN	Staatliches Museum für Naturkunde, Stuttgart, Germany

Taxonomic account

Checklist of taxa of the Palaearctic Region

Homadaula Lower, 1899
= *Galactica* Walsingham, 1911, syn. nov.

H. anisocentra Meyrick, 1922	China, Japan
H. caradjae (Walsingham, 1911) [*Galactica*], comb. nov.	Algeria
H. punctigera (Rebel, 1910) [*Paraprays*]	Uzbekistan, Kyrgistan
H. schaeuffelei (Amsel, 1959) [*Bahrlutia*], comb. nov.	Iran, Pakistan

Zarcinia Chrétien, 1915
= *Bahrlutia* Amsel, 1935, syn. nov.

Z. ghorella (Amsel, 1935) [*Bahrlutia*], comb. nov.	Israel
Z. nigrosignatella Chrétien, 1915	Tunisia
Z. stshetkini sp. nov.	Tajikistan, Afghanistan
Z. walsinghami (Caradja, 1920) [*Galactica*], comb. nov.	Russia, Kazakhstan
Z. spec.	Iran

Incertae sedis

Galactica variinotella (Chrétien, 1915) [*Psecadia*]	Tunisia
Homadaula disperdita Meyrick, 1922	China
Zarcinia sacra Meyrick, 1925	Egypt

Key to genera of Palaearctic species of Galacticidae

The genera and species of Galacticidae cannot be distinguished by external characters alone. Contrary to the opinions of Chrétien (1915) and Amsel (1935), who established their genera on seemingly deviating wing characters of wing venation, the genera and species of the family exhibit a corresponding fore- and hindwing venation with only minor variations that are insufficient for a generic separation. The presence or absence of the henia in the females and the corresponding short or elongated phallus in the males are the principal features for accepting two different genera. However, the occurrence of a henia is not a character restricted to Galacticidae, but occurs also in other families such as Tineidae (e.g., *Infurcitinea* Spuler, 1910), Scythrididae (e. g. *Episcythris* Amsel, 1939, *Scythris* Hübner, 1825), Gelechiidae (e.g., *Teilopsis* Sattler, 1960) and in Lycaenidae (e.g., *Lysandra* sp.). In these families, this character is not used for separating and accepting different genera. In Galacticidae, the presence or absence of the henia is considered important enough to justify the grouping of species in two different genera.

1 Female genitalia with ostium bursae as round opening in membrane beyond distal margin of sternum VIII; phallus of male elongated, protruding and twisted ..... ***Zarcinia***

– Female genitalia with ostium bursae on tip of membranous process (= henia); phallus of male short, retracted within segment IX ..... ***Homadaula***

Review of taxa

Galacticoidea Dugdale, Kristensen, Robinson & Scoble (1998)

Handbook of Zoology, vol. 4(35): 217

Galacticidae Minet, 1986

Type genus. *Galactica* Walsingham, 1911; by subsequent selection. Alexanor 14(7): 305–306.

Remarks. In the phylogenetic tree of Heikkilä et al. (2015), which was based on a combination of molecular and morphological data, the family emerged in the Apoditrysia as sister group of Tortricoidea. A similar result was recovered by the molecular study of Regier et al. (2013). This placement is in contrast to the morphological results of Friese (1960, 1962, 1966), Moriuti (1963) and Kyrki (1984, 1990) who considered the group as belonging to the Yponomeutoidea. Alternative systematic positions in Tineoidea or Urodidae were proposed by Common (1990) and Heppner (1998) respectively. In fact, there are a number of morphological traits which are shared by Galacticidae and various groups in Tineoidea and Yponomeutoidea. To these characters should be added the presence of an unscaled, transparent patch in the hindwings at the wing base lying between Cu1 and Cu2. This character went widely unnoticed and, occurring in most examined species of Galacticidae, must be included in the taxonomic diagnosis of the family. The similar transparent patch in *Yponomeuta* has an array of ridges, which may be used to produce sounds (Agassiz 2017). These ridges do not occur in the transparent patches of Galacticidae. The function of such patches and their occurrence in Microlepidoptera were recently investigated by O'Reilly (2021), who coined the term aeroelastic tymbals for those hyaline spots. They produce ultrasound by wingbeat movements and are thus acoustically active structures serving as an anti-bat defence.

Galacticinae Friese, 1966

Beitr. Ent. 16: 447 [in Plutellidae]

Homadaula Lower, 1899

Homadaula Lower, 1899: 115. Type species *H. lasiochroa* Lower, 1899; by monotypy, type locality: New South Wales, Broken Hill.
Homadaula Lower, 1899: Meyrick (1914), Meyrick (1917), Caradja and Meyrick (1935), Clarke (1943, 1967); Friese (1962), Inoue et al. (1982), Kyrki (1984), Minet (1986), Common (1990), Nielsen and Edwards (1996), Dugdale et al. (1998), Holloway et al. (2001), Mey (2004, 2007, 2011), Hirowatari et al. (2013).
Paraprays Rebel, 1910: 13–14. Type species *P. punctigera* Rebel, 1910; by monotypy, type locality: Alai Mts. [Kyrgyzstan], synonymised by Clarke (1967: 228).
Paraprays Rebel, 1910: Meyrick (1914), Moriuti (1963), Friese (1962), Kyrki (1990).
Galactica Walsingham, 1911: 14–15. Type species *Galactica caradjae* Walsingham, 1911; by monotypy, type locality: Algeria, Biskra, syn. nov.
Galactica Walsingham, 1911: Turati (1930), Friese (1960), Sattler (1967), Kyrki (1990), Mey (2004), Anikin et al. (2006, 2017).
Stichotactis Meyrick, 1930: 562–563. Type species *S. calamitosa* Meyrick, 1930: by monotypy, type locality: Sudan, Gendettu, bred from flowers of "*Acacia nilotica* and *A. arabica*", synonymised by Clarke (1967: 228).

Diagnosis. Male genitalia with tergum IX reduced or with uncus and remnants of gnathos invaginated into segment VIII, phallus short, not projecting, sclerotized, dagger-like and pointed, ankylosed with larger anellus forming a structure with complicated morphology.

Female genitalia with segment VII with sclerotised sternum and tergum, sometimes fused to a certain degree; dorsal side of tergum a broad, bilobed or compact plate without median, shallow groove; caudal margin of sternum VII symmetrical in ventral view, ostium bursae a small opening on tip of elongate and freely projecting, sterigmal tube (= henia), membranous or weakly sclerotised; ductus bursae barely longer than bursa copulatrix; bulla seminalis absent or present; bursa with or without signa.

Homadaula anisocentra Meyrick, 1922

Homadaula anisocentra Meyrick, 1922: 47, type locality: China, Tsingtau, female holotype in DEI [not examined]

Material examined. 1 ♂, Japan, Honshu, Gifu Province, Shira-kawa, 380 m, Oppara, 19.vi.2003, LF, leg. W. Mey (MfN).

Homadaula caradjae (Walsingham, 1911), comb. nov.

Figs 1–2

Galactica caradjae Walsingham, 1911: 14–15, type locality: Algeria, Hammam-es-Salahin.

Material examined. type material Holotype ♀, "Hammam-es-Salahin/Algeria/18.iv.1904/Wlsm. 97923"[printed on white card], "BM ♀/Genitalia slide/No 5615" [made by JW Tremewan] (BMNH). Paratype ♀, "Biskra/Korb 1902" [hand-written on white card], "3984/Wlsm 1903" [printed on white card with inscriptions], "859" [printed], "09" [hand-written], "Paratypus"[printed on red card], genitalia slide G. Friese 859 (MGAB); 1 ♀, [Algeria] Biskra, 4.vii.1907, leg. Chrétien, coll. Caradja, genitalia slide Friese 860 (MGAB).

Remarks. In the genitalia slides of both the holo- and paratype, the henia of the female genitalia is clearly visible. This character is an apomorphic and diagnostic feature of *Homadaula*. Its presence in *G. caradjae* necessitates the transfer of this species to the genus *Homadaula* Lower, 1899, which has priority over *Galactica* Walsingham 1911. The name of the family is not affected by this taxonomic change.

The species was never reported again since it was collected in North Africa. The male sex is unknown, which renders the identification of the species difficult. The species resembles *Z. schaeuffelei*, and new material from Northern Africa would be necessary to clarify the identity of *H. caradjae*.

Homadaula punctigera (Rebel, 1910)

Figs 3–4, 17, 18–20

Paraprays punctigera Rebel, 1910: 13–14, type locality: Alai Mts., types in NHMW and MGAB [not examined].

Material examined. 1 ♂, [Uzbekistan], "Margelan, H[a]b[er]h[auer]" [hand-written on brown paper], ex coll. Staudinger (MfN); 5 ♂, from the same locality, but without Haberhauer indicated as collector (MfN).

Diagnosis. Forewings brown-grey, with very small, black dots along R and Cu; tarsal segments of fore- and midlegs not flecked dorsally; male with vestiges of uncus and gnathos, valvae long, dorsal process broad, not abruptly separated from apical portion.

The species is similar to *H. anisocentra* by sharing the grey-brown colour of the adults and the similar pattern of forewings. In the male genitalia, the long tergal plate and the form of the phallic apparatus (= fused with the anellus) have a similar architecture in both species.

Redescription. Adult (Fig. 3) Length of forewing 7–9 mm, wingspan 15.5–18.2 mm (n = 6); head brown-grey, frons with appressed scales, vertex and scape with semi-erected, porrect scales; labial palpi as long as eye-diameter, straight, uniformly grey-brown; unscaled proboscis pale grey; antennae filiform, 0.5 of forewing length, finely ciliated on ventral side; fore-tibia with epiphysis, tarsomeres of fore and mid-legs brown, not flecked on dorsal sides, spurs 0.2.4.; forewing brown-grey, with very small, black dots (6–10) along R and Cu, one larger dot in end of cell, dots on termen absent, underside grey-brown; hindwing somewhat paler than forewing, fringes grey; wing venation with accessory cell in forewing and complete M present in cell; hindwing with M3 and Cu1a confluent over short distance; retinaculum with grey-brown scales on underside of Sc.

Male genitalia (Figs 18–20): tergal plate of segment VIII nearly rectangular, with emarginated apex in dorsal view; pleurae and sternum membranous, simple, not lobe-like; segment IX vestigial, uncus arched, scale-like, on lateral corners attached to tergal plate and on this point with long, up-curved process; gnathos asymmetrical, valva long, dorsal process broad, elongate, directed dorsad, of apical part shorter, rounded apically; phallus short, fused sub-basally with anellus.

Female: unknown.

Distribution (Fig. 17). The species is known from the Alai Mts. situated between Kyrgyzstan and Uzbekistan. Margelan in the Ferghana Valley is the second known locality of the species collected probably in 1896 by the Austrian entomologist Josef Haberhauer (1828–1902).

Homadaula schaeuffelei (Amsel, 1959), comb. nov.

Figs 5–8, 21–26

Bahrlutia schaeuffelei Amsel, 1959: 35–36, type locality: Iran, Iranshar, Holotype and Paratype deposited in SMNS [Paratype examined].

Material examined. type material, 1 ♀ Paratype, "IRAN Beluchistan/Jranshar, 800 m/1.-10.iii.1954/Richter u. Schäuffele" [printed on grey card], "Paratypus/leg. H. Amsel" [printed on red card], genitalia slide Mey (SMNS). 1 ♂, **Pakistan**, [Province Baluchistan], 150 km south-west of Quetta, 900 m, 13.vi.1965, leg. Kasy & Vartian, genitalia slide Mey 23/21 (NHMW); 1 ♀, South **Iran**, 40 km north of Bandar-Abbas, 31.iii.1972, Exped. Mus. Vind., genitalia slide Mey 24/21 (NHMW).

Diagnosis. Male without uncus and gnathos, valvae long, dorsal process broad, elongate, directed dorsad and laterad. Female without bulla seminalis, bursa copuatrix with a sclerotised antrum of ductus bursae, dorsal and ventral side of bursa with thin medial line.

H. schaeuffelei is an unusual species of the genus by showing a completely cream-white, external appearance of the adults, resembling externally *H. caradjae*.

Redescription. Adult (Figs 5–8). Length of forewing 5–7 mm, wingspan 11.5–14.8 mm (n = 3); head white, frons with appressed scales, vertex and scapes with semi-erected scales; labial palpi as long as eye-diameter, straight, white and with brown patch on second segment; unscaled proboscis yellow-brown; antennae filiform, 0.5 of forewing length, finely ciliated on ventral side; fore-tibia with epiphysis, tarsomeres of fore and mid-legs pale brown on dorsal side, hind legs white, spurs 0.2.4.; forewing white, with small, black scales on termen and in cell forming short, indistinct or distinct patches in basal half; hindwings white, fringes white; wing venation with accessory cell in forewing and M present in cell, R4 and R5 with a short stalk, originating from distal end of accessory cell; hindwing with M3 and Cu1a confluent over short distance; one frenular bristle in male, two in females; retinaculum with white scales on underside of Sc.

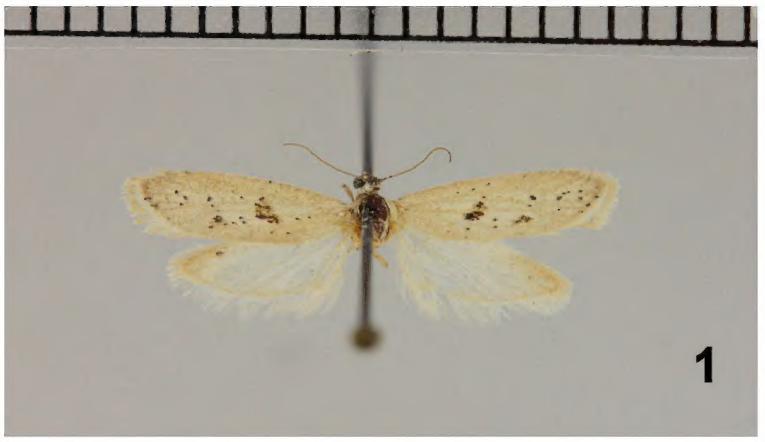
Male genitalia (Figs 21–23). Tergal plate of segment VIII tapering from broad base towards an acute apex in dorsal view; pleurae membranous, simple, not lobe-like; segment IX vestigial, uncus and gnathos absent, valvae long, dorsal process broad, elongate, directed dorsad and laterad, length of apical part longer, somewhat curved dorsad, rounded apically; phallus with large bulbus ejaculatorius and short, sickle-shaped phallus, connected sub-basally with anellus.

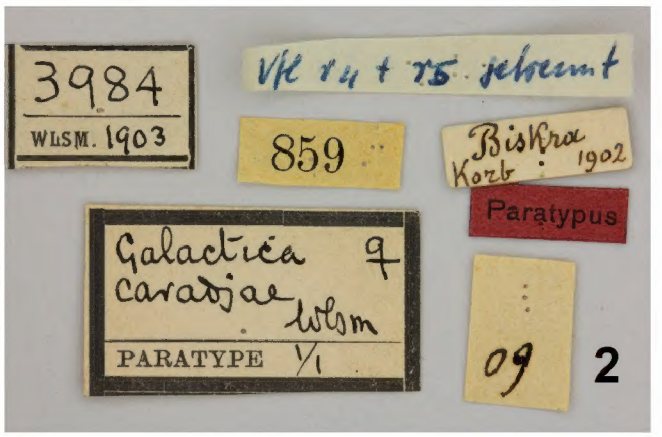
Female genitalia (Figs 24–26). Tergum VII with median, shallow groove extending to caudal margin; sternum VIII slightly overlapping with tergum laterally; distal margin of sternum VII in ventral view slightly asymmetrical, ostium bursae on tip of henia, originating in central position of inter-segmental membrane, ductus bursae shorter than bursa, small bulla seminalis present, signa in oval bursa copulatrix absent.

Biology. Host plant unknown. Adults have been collected at the lights in March and June at elevations of 800–900 m and at lower elevations.

Distribution. Iran and Pakistan.

Remarks. The male specimen from Pakistan, widely separated geographically from the localities in south Iran, is associated with *H. schaeuffelei* by observing the presence of a forked R4 and R5 in the forewing, a character, which is unique and unknown from other species of Galacticidae in the region.





Figures 1–8. Adults of *Homadaula* spp. **1–2.** *H. caradjae* (Walsingham), male paralectotype and label; **3–4.** *H. punctigera* (Rebel), male and label; **5–6.** *H. schaeuffelei* (Amsel), female paratype and label; **7.** *H. schaeuffelei* (Amsel), female, Iran; **8.** *H. schaeuffelei* (Amsel), male, Pakistan (photos by W. Mey).

Zarcinia Chrétien, 1915

Zarcinia Chrétien, 1915: 310–311. Type species *Z. nigrosignatella* Chrétien, 1915; by monotypy,
Zarcinia Chrétien, 1915: Meyrick (1925), Friese (1960, 1966), Kyrki (1990), Minet (1986),
Bahrlutia Amsel, 1935: 213–214. Type species *B. ghorella* Amsel, 1935, by monotypy, syn. nov.
Bahrlutia Amsel, 1935: Amsel (1959), Minet (1986).

Diagnosis. Male genitalia with tergum IX reduced and invaginated into segment VIII, phallus elongated, sclerotized and asymmetrically screwed; female genitalia with segment VII with sclerotised sternum and tergum; dorsal side of tergum (= tergal plate) with median, shallow groove; caudal margin of sternum VII symmetrical or asymmetrical in ventral view, ostium bursae a large, rounded opening in central or lateral position of intersegmental membrane between segments VII and VIII, rim of ostium sclerotised, antrum present; ductus bursae longer than bursa copulatrix; bulla seminalis present or absent; bursa without signa.

Zarcinia ghorella (Amsel, 1935) comb. nov.

Figs 9–10, 36–38

Bahrlutia ghorella Amsel, 1935: 214, type locality: Israel, West-Jordan Land, Holotype deposited in LMK [examined].

Material examined. Holotype ♀, "Südende d[es]/Toten Meers/15. –27.3.[19]33/H. Amsel" [printed], "gesammelt v./ Aigner" [printed], "Typus/leg. H. Amsel" [printed on red card], genitalia slide Mey 28/21 (LMK).

Diagnosis. *Zarcinia ghorella* externally resembles *Z. walsinghami*. It can be distinguished by characters of female abdomen and genitalia, e.g., tergum and sternum VII overlapping in lateral view, median groove of tergum VII in central position and bulla seminalis absent.

Redescription. Adult (Fig. 9). Length of forewing 5.6 mm, wing span 13 mm (n = 1). Head white, frons with appressed scales, vertex and scapes with semi-erected scales; labial palpi as long as eye-diameter, straight, white and with a small black patch on tip of second segment; unscaled proboscis pale brown; antennae filiform, 0.5 of forewing length, very shortly ciliated on ventral side; fore-tibia with epiphysis, tarsomeres of fore and mid-legs brown to black on dorsal side, white-ringed at tips, hind legs white, spurs 0.2.4.; forewing white, with small black spots on termen and costa, a second line of small spots parallel to spot line on termen, further spots scattered on wing and forming a round crowd in basal half; hindwing white, yellow-brown towards apices, fringes white; wing venation with accessory cell in forewing and M present in cell, hindwing with M3 and Cu1a shortly confluent or connected in a point; three frenular bristles in females; retinaculum with white scales on underside of Sc.

Female genitalia (Figs 36–38). Tergum and sternum of segment VII shortly overlapping in lateral view, tergum VII with median, shallow groove broad not reaching caudal margin; distal margin of sternum VII in ventral view strongly asymmetrical, ostium bursae with sclerotised rim and antrum on right hand side in intersegmental membrane, close to right, sternal margin, ductus bursae longer than bursa, signa in oval bursa copulatrix absent.

Biology. Host plant unknown.

Distribution. Israel.

Remarks. In the original description two available specimens were mentioned. One is obviously lost, and the remaining individual is the one which was designated by Amsel as the type, which is interpreted here as a valid holotype designation.

Amsel (1935) established the genus *Bahrlutia* by certain differences in the wing venation, which he observed by comparing his species with the original illustration of *Z. nigrosignatella*. In fact, there are no such differences, and Amsel was probably misled by an incorrect figure of Chrétien (1915).

The descriptions of three, unrevised species summarised in the *incertae sedis* group are more or less in agreement with the description of *Z. ghorella*. In the case of conspecifity with one or all of these species, which could be detected in the future, *Z. ghorella* would become a synonym of one of those species.

Zarcinia nigrosignatella Chrétien, 1915

Figs 45–47

Zarcinia nigrosignatella Chrétien, 1915: 310–311, type locality: south Tunisia, Zarcine-Kebili, type in MNHN [not examined].

Material examined. 2 ♀, "Gabes, Tunis/1895, Reit." [Tunisia], genitalia slide Mey 04/04, ex coll. Staudinger (MfN).

Remarks. The holotype of the species could not be traced in the MNHN and is probably lost. The two females from the Staudinger collection agree in external appearance with the illustrations and description of the type specimen and are interpreted here as representing *Z. nigrosignatella*. The female genitalia are illustrated in Figs 45–47. In contrast to other congeners, the ostium bursae is small and situated in the intersegmental membrane in a central position, and the distal margin of sternum VII is straight and symmetrical.

Zarcinia stshetkini sp. nov.

http://zoobank.org/64E83448-89DF-438E-B085-57581B343A36

Figs 11–12, 15, 27–32

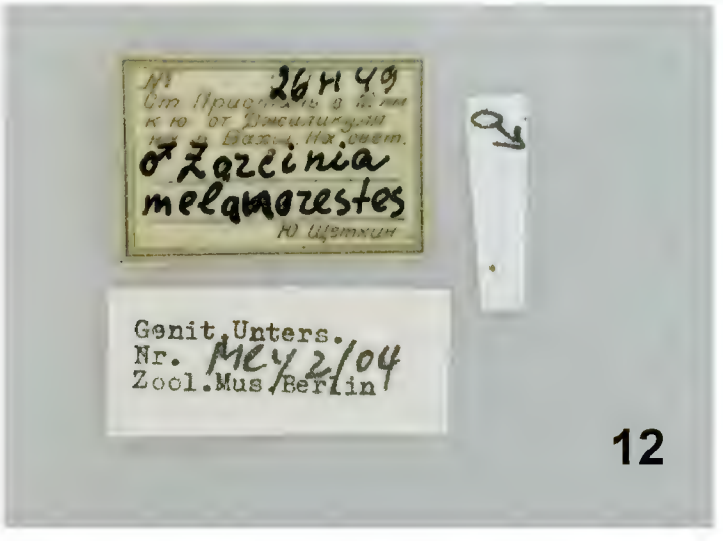
Material examined. Holotype ♂, [**Tajikistan**], Pristan, 12 km south of Dschlikulja, on Vahsh River, at the lights, 38.442494°N, 69.559346°E, 24.vi.[19]49, leg. Y. Stshetkin, genitalia slide Mey 2/04 (MfN).

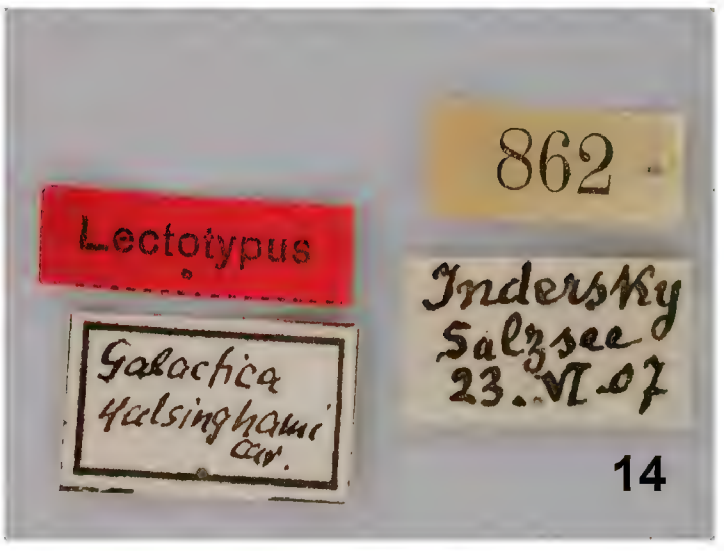
Paratypes: 4 ♀, same locality: 30.vii.148; 3.xi.1948, genitalia slide Mey 3/04; 31.v.1949; 14.vi.1949, genitalia slide Mey 22/21; 16.vi.1949, all leg. Y. Stshetkin; 1 ♀, Lower Vahsh River, Tigrovaja Balka, 9.x.1949, leg. Y. Stshetkin; 1 ♀, Vahsh River valley, Molomovabadskyi rayon, 30.viii.1953, leg. Y. Stshetkin, genitalia slide Mey 21/21 (all in MfN); 1 ♂, **Tajikistan**, South: Dusti vill. 10 km E Tigrovay Balka, res. Vahsh river, 330 m, 8.–12.v.2017, leg. D. Goschko, genitalia slide 4154 KL (coll. K. Larsen);

2 ♂, **Kazakhstan**, Almaty, Shengeldy, 10 km SW of Almatinskiye, Sun Mare, 43°56'32"N, 77°20'49"E ,7.–9.vi.2018, 480 m leg. Knud Larsen, genitalia slide 4147 KL (coll. K. Larsen); 4 ♂ 1 ♀, Kazakhstan, Almaty: Bakbakty, 6 km W, Jeppesen Party, 44°33'41"N, 76°38'20"E, 30.v. –2.vi.2018, 410 m leg. Knud Larsen, genitalia slide male 4148 KL (coll. K. Larsen);

Paratypes: 2 ♀, **Afghanistan**, Nuristan, 25 km north of Barikot, 1800 m, 12.–17.vii.1963, leg. Kasy & Vartian, 1 ♀ without abdomen, genitalia slide Mey 26/21 (NHMW).

Diagnosis. *Zarcinia stshetkini* sp. nov. resembles *Z. walsinghami*. It can be distinguished by characters of male and female genitalia. In the male, the new species differs from *Z. walsinghami*





Figures 9–16. Adults of *Zarcinia* spp. **9–10.** *Z. ghorella* (Amsel), holotype and label; **11–12.** *Z. stshetkini* sp. nov., male holotype and label; **13–14.** *Z. walsinghami* (Caradja), male paralectotype and label; **15.** *Z. stshetkini* sp. nov., female, Afghanistan; **16.** *Zarcinia* sp., female, Iran (photos by W. Mey).

by the dorsal process of the valva, which is directed caudad and shorter than the apical part, whereas it is directed distad and longer in *Z. walsinghami*. The pallus is as long as the valva and double twisted in contrast to *Z. walsinghami*, whose phallus is simply curved and shorter than half length of the valva. The distal tip of the tergal plate is lobe-like and rounded with a short, median tip in the new species, but triangular and acute in *Z. walsinghami*. In the female genitalia, the bulla seminalis is absent and the ductus bursae much longer than the bursa in the new species

Description. Adult (Figs 1, 15). Length of forewing 6–7.5 mm, wingspan 13–16.5 mm (n = 11); head white, frons with appressed scales, vertex and scapes with semi-erected scales; labial palpi as long as eye-diameter, straight, white and with a brown patch on second segment; unscaled proboscis pale brown; antennae filiform, 0.5 of forewing length, finely ciliated on ventral side; fore-tibia with epiphysis, tarsomeres of fore and mid-legs brown on dorsal side, hind legs white, spurs 0.2.4.; forewing white, with small black spots on termen and costa, forming short, oblique streak in basal half; hindwing white, fringes white; wing venation (Fig. 32) with accessory cell in forewing and M present in cell, hindwing with M3 and Cu1a shortly stalked or from a point; one frenular bristle in male, four to five in females; white scales of retinaculum on underside of Sc.

Male genitalia (Figs 27–31). Tergal plate of segment VIII with broad base and narrow, lobe-like distal part, apex bifid in lateral view; pleurae membranous, with long, spreading, bristle-like scales; segment IX vestigial, gnathos a pair of asymmetrical, triangular pieces, valvae long, dorsal process trapezoid, directed caudad, apical part short, broadly rounded; phallus tubular, thin and twisted, as long as valvae, connected sub-basally with bifid anellus.

Female genitalia (Figs 39–41). Tergum VII with median, shallow groove extending beyond caudal margin; distal margin of sternum VII in ventral view asymmetrical, ostium bursae with sclerotised rim, on right hand side in intersegmental membrane, close to sternal margin, ductus bursae longer than bursa, signa in oval bursa copulatrix absent.

Biology. Host plant unknown. Adults have been collected from May to October at elevations of 1000–1800 m.

Distribution (Fig. 17). Kazakhstan, Tadjikistan, Afghanistan.

Etymology. The specific name is dedicated to the memory of Yuri Leontovich Stshetkin (1919–1995), a Russian lepidopterist, who lived and collected Lepidoptera mainly in Tajikistan. He intensively explored the Lepidoptera fauna of the upper Vachsch valley (Stshetkin 1981), where he collected the new species.

Zarcinia walsinghami (Caradja, 1920), comb. nov.

Figs 13–14, 33–35, 42–44, 49

Galactica walsinghami Caradja, 1920: 90, type locality: Inderskysche Salzsteppe, Uralsk [Kazakhstan], lectotype designation by Shovkoon in Trofimova et al. (2017): 456. *Galactica walsinghami* ab. *pluripunctella* Caradja, 1920 [infrasubspecific]: 90, type locality: Kalmykov, invalid lectotype designation by Shovkoon in Trofimova et al. (2017): 456, synonymised with *G. walsinghami* by Anikin et al. (2006).
Galactica walsinghami: Mey (2004), Anikin et al. (2006), Knyazev et al. (2016), Trofimova et al. (2017).
Calantica bootella Turati, 1926: 68, type locality: [Libya], Porto Bardia, synonymised by Turati 1930: 77–78
Zarcinia melanozestas Meyrick, 1935: 556, type locality: Daghestan [Russia], synonymised by Anikin et al. 2006: 466

Material examined. type material, lectotype ♂, **Kazakhstan,** "Indersky/Salzsee/23.vi.[19]07"[hand-written on white paper], genitalia slide G. Friese 862, (MGAB); Paralectotype ♂, "Uralsk/29.vi.[19]07"[hand-written on white paper],

genitalia slide Friese 863 (MGAB); Holotype ♀, ab. *pluripunctella*, "Kalmykov/26.vi.[19]07", genitalia slide G. Friese 861 (MGAB); Lectotype ♀ of *Zarcinia melanozestas*, genitalia slide 7475, (BMNH) [examined]; 1 ♀, South Kazakhstan, Kzyl-Orda, 170 m, 44°51'N, 65°31'E , 01.v.1993, leg. M. Danilevsky, ex. coll. Schintlmeister, genitalia slide Mey 01/04 (MfN); 2 ♂, 1 ♀, Kazakhstan, Atyrau Region, 47°16'N, 53°50'E, 9.v.2007, leg. Trofimova & Shovkoon (coll. Shovkoon); 1 ♂, Kazakhstan, Kyzyl-Orda region, Karatup peninsula of Aral Lake, 46°20'N, 59°43'E, 26.v.2006, leg. Trofimova & Shovkoon (coll. Shovkoon); 3 ♂, Kazakhstan, Mangistau, Ustyurt Nature Reserve, Karynzharyk Sand, Saksorka well, 43°17'N, 53°33'E, 5.v.2010, 580 m, leg. Knud Larsen, genitalia slide male 4151 KL (coll. K. Larsen); 1 ♂, **Russia**, Orenburg Region, Sol'-Ileck area, 50°38'N, 54°42'E, leg. Shovkoon (coll. Shovkoon).

Diagnosis. *Zarcinia walsinghami* resembles *Z. stshetkini* sp. nov. The males differ in the form of the valva and the size of the phallus. In the female genitalia, the bulla seminalis is present in *Z. walsinghami* and absent in *Z. stshetkini* sp. nov.

Description. Adult (Fig. 13). Length of forewing 8–9 mm, wingspan 17–20 mm (n = 3); head white, frons with appressed scales, vertex and scapes with semi-erected scales; labial palpi longer as eye-diameter, straight, white and with a brown patch on second segment; unscaled proboscis pale grey; antennae filiform, 0.5 of forewing length, finely ciliated on ventral side; tarsomeres of fore and mid-legs brown on dorsal side, tips white, hind legs white, spurs 0.2.4.; forewing white, with numerous small, black spots, forming no distinct streak in basal half; hindwing white, pale brown towards tips, fringes white; wing venation as in Fig. 32 with accessory cell in forewing and M present in cell, hindwing with M3 and Cu1a fused over a short distance; one frenular bristle in male, three in females; white scales of retinaculum on underside of Sc.

Male genitalia (Figs 33–35). Tergal plate of segment VIII nearly triangular with broad base and acute apex in dorsal view; pleurae membranous; segment IX vestigial, gnathos a pair of asymmetrical, triangular pieces, valvae long, dorsal process trapezoid, directed distad, apical part as long as dorsal process; phallus tubular, thin and curved, as long as half of valva length, connected sub-basally with bifid anellus.

Female genitalia (Figs 42–44). Tergum VII with median, shallow groove extending beyond caudal margin; distal margin of sternum VII in ventral view asymmetrical, ostium bursae with sclerotised rim, on right hand side in intersegmental membrane, close to sternal margin, ductus bursae longer than bursa, signa in oval bursa copulatrix absent, bulla seminalis present, inserted to ductus bursae close to ductus seminalis.

Biology. The species was reared by Knyazev et al. (2016), who also described the larvae. The food plant was identified by as *Limonium caspicus* Willdenow, a species with a wide distribution around the northern part of the Caspian Sea to southern Siberia and Kazakhstan. The larvae live in webs spun throughout the affected leaves and flowers (Fig. 49). When fully crown the larvae spin cocoons between leaves and inflorescences of the host plant and overwinters in this stage. Judging from collecting dates of adults, the species probably has two generations per year.

Distribution (Fig. 17). Dagestan, eastern Russia, Kazakhstan.

Remarks. *Galactica walsinghami* was described from specimens from Indersky Salt Lake near Uralsk in northern Kazakhstan. The species remained uncollected for more than 100 years. Anikin et al. (2006) synonymised *Zarcinia melanozestas* Meyrick, 1925 with *G. walsinghami* without providing evidence and data from freshly collected specimens, but mentioned *Limonium gmelini* (Plumbaginaceae) as the host plant of the species. The type locality of *Z. melanozestas* in Dagestan is Khasaviurt Town (= Chasav`urt, 43°15'N, 46°37'E, 121 m), which is situated on the western side

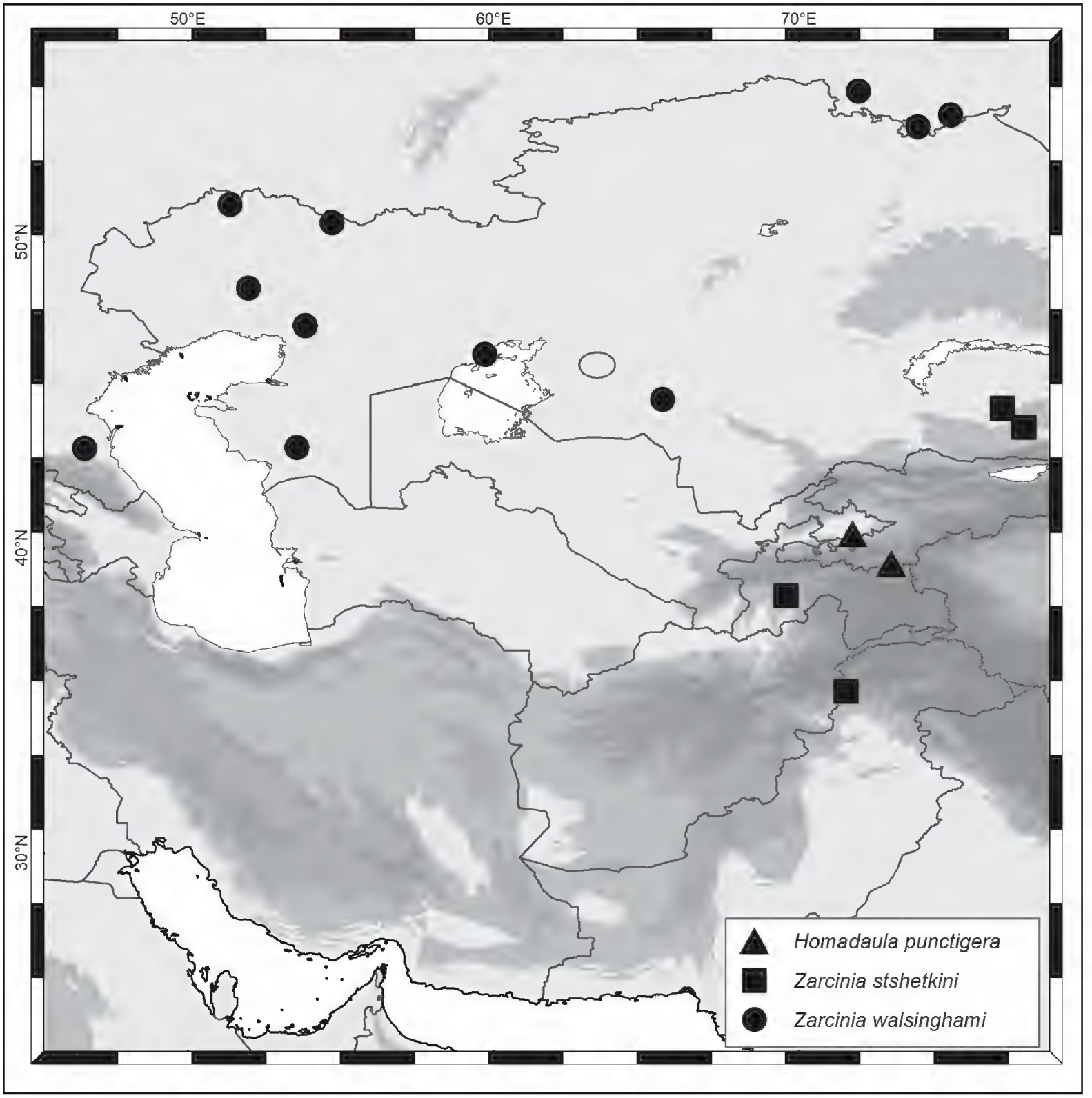


Figure 17. Distribution of *Homadaula punctigera* (Rebel), *Zarcinia stshetkini* sp. nov. and *Z. walsinghami* (Caradja) in Central Asia.

of the Caspian Sea. The collecting site lies in the arid steppe zone, which reaches the foothills of the eastern Caucasus in this area. Knyazev et al. (2016) reported localities and specimens collected in Western Siberia and mentioned the general occurrence of the species in the steppe zone of Eastern Russia (Sinev 2008), western Siberia and northern Kazakhstan.

Photos of adults were published by Knyazev et al. 2016 and Anikin et al. 2017. The male genitalia were photographed by D.S. Shovkoon from genitalia slides made by G. Friese. The latter author designated a lectotype (Nr. 862) and paralectotype (Nr. 863) but did not publish the designations. The photo of the male paralectotype is provided in Fig. 35.

Turati (1930) synomymised his species *Calantica bootella* Turati, 1926 with *B. walsinghami*. This action was initiated by a proposal of Caradja, who considered both species as conspecific. The

synonymy was assumed by comparing images of adults and was not based on examination of the genitalia, which is the only way to determine generic affiliations in this family. The synonymy is therefore doubtful. The species is either a synonym of *H. caradjae*, *Z. ghorella*, *Z. nigrosignatella*, *Z variinotella* or represents a distinct species.

Zarcinia spec.

Figs 16, 48

Material. 1 ♀, Iran, 70 km south of Teheran, 1300 m, 5.v.1965, leg. [F.] Kasy & [A.] Vartian, genitalia slide Mey 25/21 (NHMW).

Remarks. According to the genitalia, the single female represents an undescribed species. It mainly differs from *Z. ghorella*, *Z. stshetkini* sp. nov. and *Z. walsinghami* in the median position of the ostium bursae in the intersegmental membrane ventrally between segment VII and VIII. The abdominal segments are more melanised than in other species and especially the surface of sterna VI and VII have a rough surface formed by minute denticules (Fig. 48).

With only one female individual at hand, the species is not named and described here. More material including males should be collected in the area of the known locality, which would provide a more adequate basis for a species description.

Species *incertae sedis*

Homadaula variinotella (Chrétien, 1915)

Psecadia variinotella Chrétien, 1915: 339, type locality: Gafsa, Tunisia, lectotype in MNHN [not examined].
Galactica variinotella: Sattler (1967: 140).

Remarks. The male lectotype was designated by Sattler (1967: 140) who transferred the species provisionally from the family Ethmiidae to *Galactica*. The genitalia were unfortunately not examined and not illustrated. From the original description alone, the generic affiliation cannot be determined. The type is missing in the MNHN.

Homadaula disperdita Meyrick, 1922

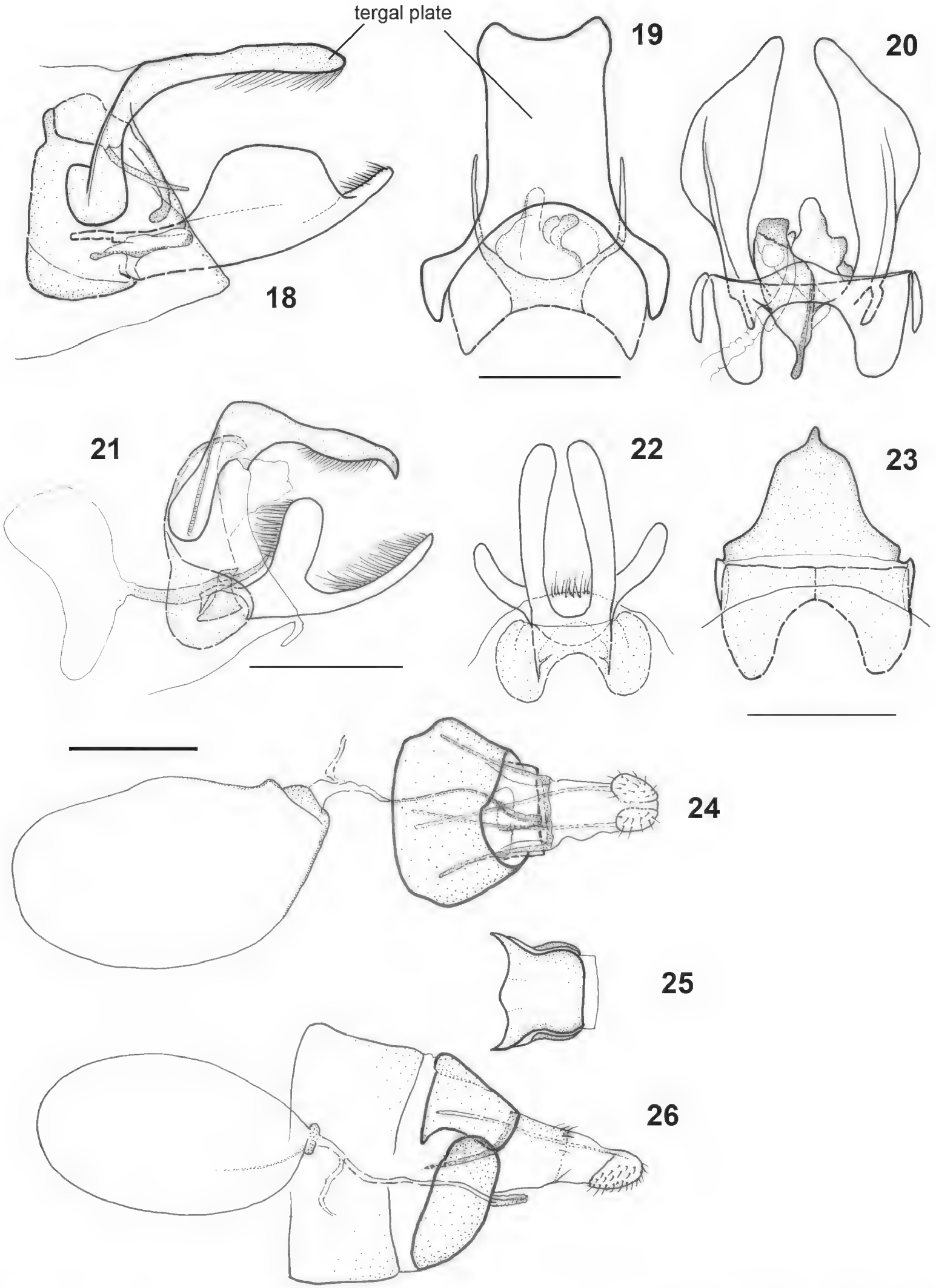
Homadaula disperdita Meyrick, 1922: 551, type locality: Shanghai, China.

Remarks. From the original description alone, the generic affiliation cannot be determined. The type specimen is missing in coll. E. Meyrick (NHMUK).

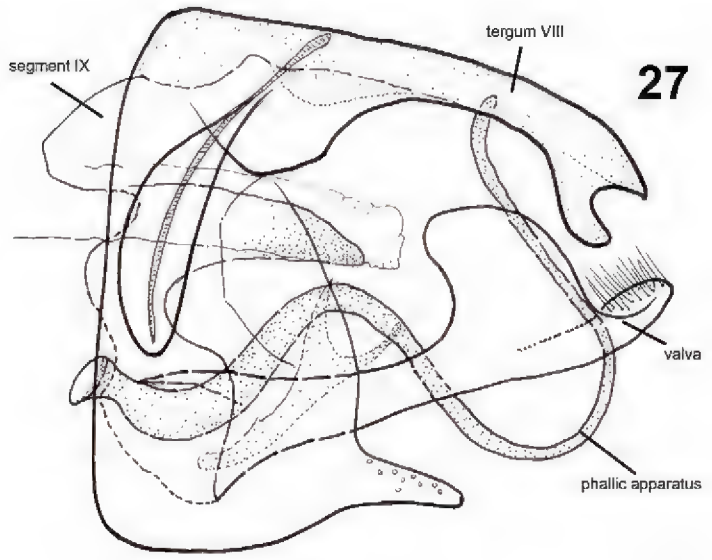
Zarcinia sacra Meyrick, 1925

Zarcinia sacra Meyrick, 1925: 214, type locality: Egypt.

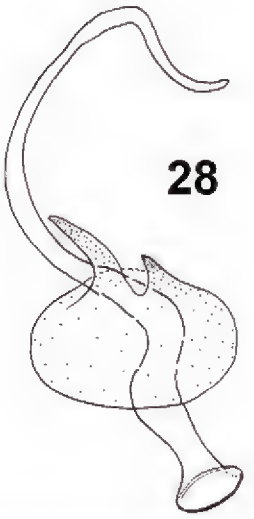
Remarks. From the original description alone, the generic affiliation cannot be determined. The type specimen is missing in coll. E. Meyrick (NHMUK).



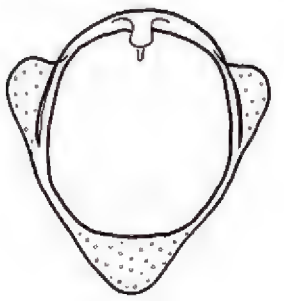
Figures 18–26. Male genitalia of *Homadaula punctigera* (Rebel), **18.** Lateral; **19.** Dorsal; **20.** Ventral; **21–23.** Male genitalia of *H. schaeuffelei* (Amsel); **21.** Lateral; **22.** Ventral; **23.** Dorsal; **24–26.** Female genitalia of *H. schaeuffelei* (Amsel); **24.** Ventral; **25.** Segment VII dorsal; **26.** Lateral.



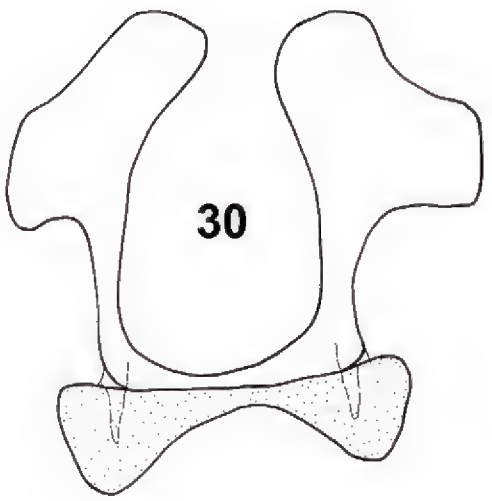
27



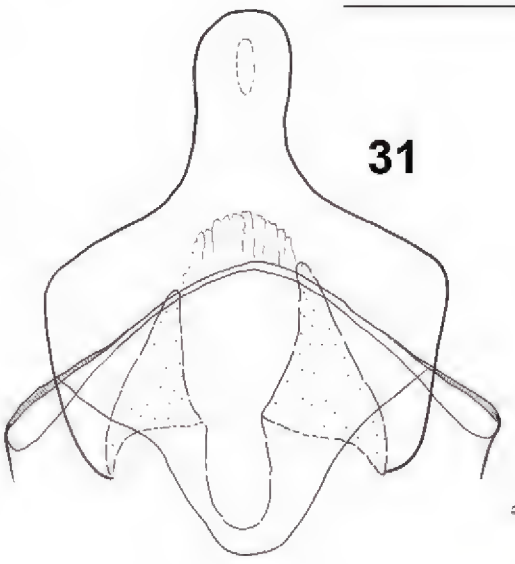
28



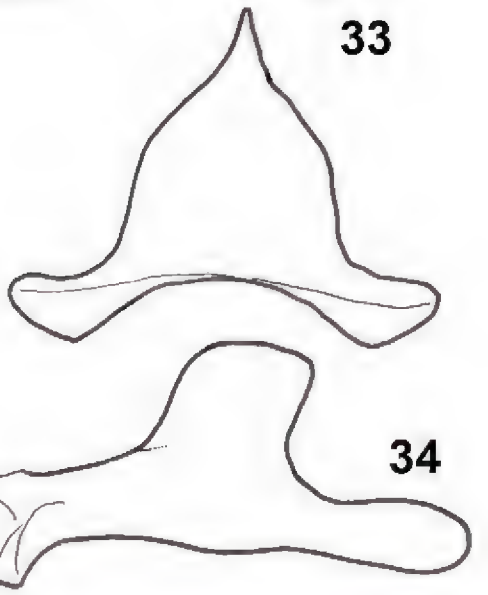
29



30

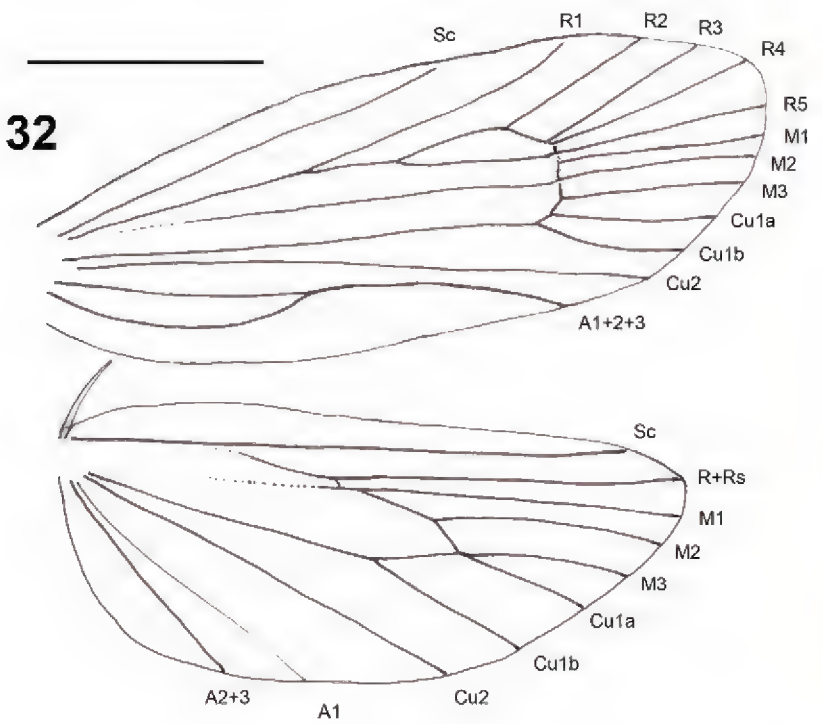


31



33

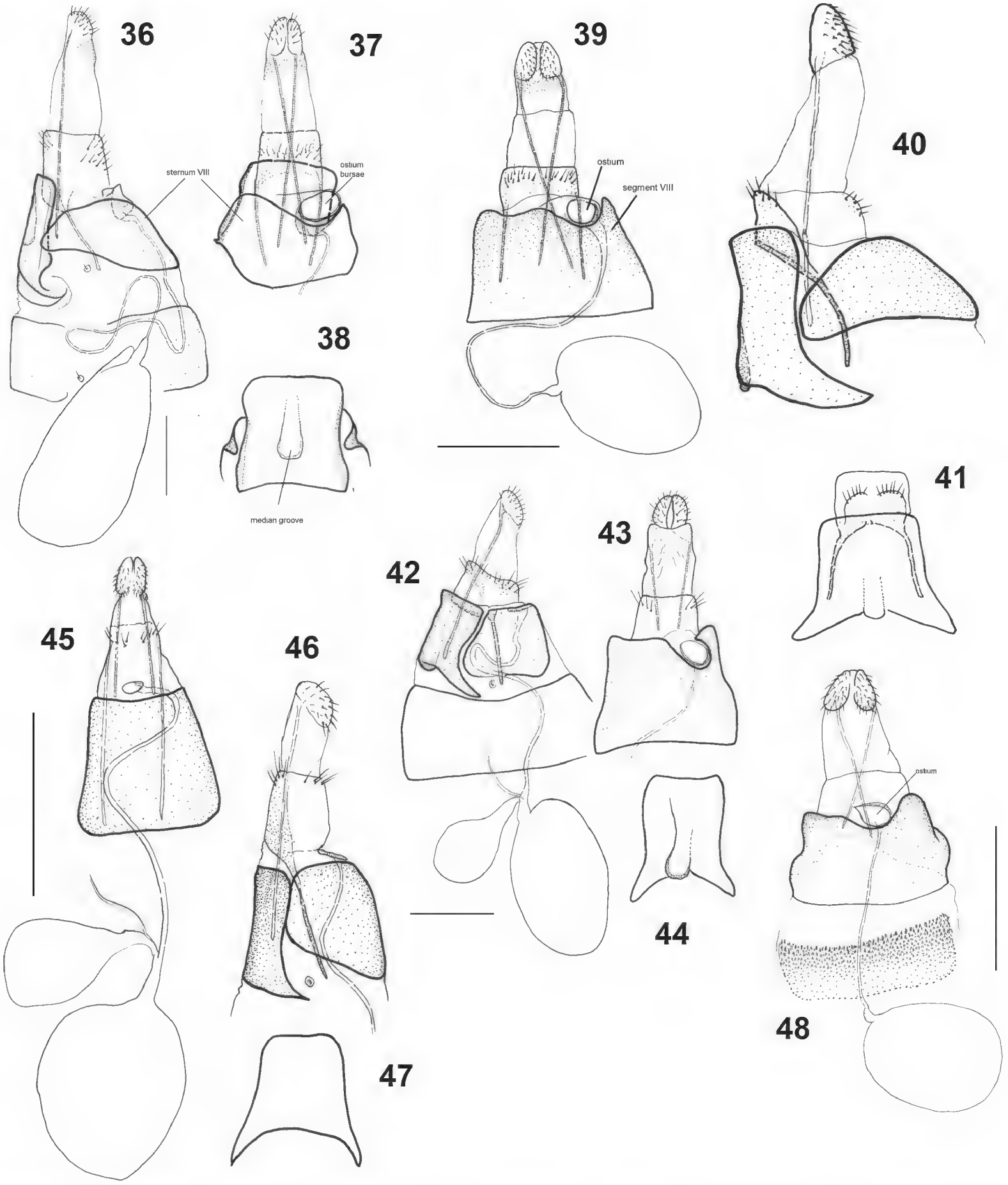
34



32

35

Figure 27–35. *Zarcinia* spp., male genitalia of *Z. stshetkini* sp. nov., holotype; **27.** Lateral; **28.** Phallus and anellus, ventral; **29.** Segment VIII, caudal; **30.** Ventral; **31.** Dorsal; **32.** Wing venation; **33–35.** Male genitalia of *Z. walsinghami* (Caradja); **33.** Tergal plate, dorsal; **34.** Valva, lateral; **35.** Genitalia of paralectotype, caudal (genitalia slide Friese 863).



Figures 36–48. Female genitalia of *Zarcinia* spp., **36–38.** *Z. ghorella* (Amsel), holotype; **36.** Lateral; **37.** Ventral; **38.** Segment VII, dorsal; **39–41.** *Z. stshetkini* sp. nov.; **39.** Ventral; **40.** Lateral; **41.** segment VII, dorsal; **42–44.** *Z. walsinghami* (Caradja), Kzyl-Orda; **42.** Lateral; **43.** Ventral; **44.** Segment VII, dorsal; **45–47.** *Z. nigrosignatella* (Chrétien); **45.** Ventral; **46.** Lateral; **47.** Segment VII, dorsal; **48.** *Zarcinia* sp., Iran, ventral view.

Figure 49. Larva and larval webs of *Zarcinia walsinghami* (Caradja) on flowers of *Limonium caspicus* (photo: SA Knyazev).

Discussion

The taxonomy of *Homadaula* and *Zarcinia* is still far from being resolved. The types of a number of species are missing and the opposite sex of others are unknown. We can only hope for freshly collected material of both genera coming from Microlepidoptera samples of the known type localities in North Africa and adjacent regions. Unfortunately, faunistic studies in these areas are difficult to carry out at present, and we probably have to be satisfied with a poor knowledge on the family for a while. The host plant of *Zarcinia walsinghami* was identified by Knyazev et al. (2016) as *Limonium caspicum* Willdenow. This plant genus encompasses many widespread and endemic species occurring from Central Asia to the Mediterranean, which is suggests the discovery of further records and species of *Zarcinia* spp. in this area, e.g., in Turkey and even in Greece.

Acknowledgements

My thanks go to D. Bartsch (SMNS), S. Gaal-Hazler and M. Lödl (NHMW), O. Bidzilia, M. Falkenberg and R. Trusch (SMNK), and D. Lees and K. Tuck (NHML) for their kind help and assistance in providing type material from the collections under their care. S.A. Khyazew (Omsk) and D. Shovkoon (České Budejovice) provided valuable information and literature. K. Larsen (Copenhagen/Dyssegaard) sent images of adults and genitalia slides of specimens from his collection. I am grateful to J. Mey (University of Potsdam), who

provided the map, and to J. Dunlop (MfN, Berlin), who corrected the English text. The reviewers O. Karsholt and D. Shovkoon, the subject editor L. Kaila, and editor of Nota Lepidopterologica are thanked for their constructive criticism and suggestions.

References

Agassiz DJL (2017) Do small ermine moths sing? Possible stridulatory sound production in Yponomeutidae (Lepidoptera). Journal of Natural History 51: 21–22, 1229–1236. https://doi.org/10.1080/00222933.2017.1324063

Amsel HG (1935) Zur Kenntnis der Mikrolepidopterenfauan des südlichen Toten-Meer-Gebietes, nebst Beschreibung neuer Palästinensischer Macro- und Mikrolepidopteren. Veröffentlichungen aus dem deutschen Kolonial- und Übersee-Museum, Bremen 1(2): 203–221.

Amsel HG (1959) Microlepidoptera aus Iran. Stuttgarter Beiträge zur Naturkunde, Stuttgart 28: 1–47.

Anikin VV, Sachkov SA, Zolotuhin V (2006) Fauna Lepidopterologica Volgo-Uralensis. 150 years later: Changes and additions. Part 11. Epermenioidea, Yponomeutoidea, Choreutidae et Galacticidae (Insecta, Lepidoptera). Atalanta 37(3/4): 457–467.

Anikin VV, Sachkov SA, Zolotuhin V (2017) Fauna Lepidopterologica Volgo-Uralensis from P. Pallas to present days. Proceeding of the Museum Witt (Munich-Vilnius) 7, 696 pp.

Chrétien, P. (1915) Contribution à la connaissance des Lépidoptères du nord de l`Afrique. Annales de la Société Entomologique de France 84: 289–374.

Caradja A (1920) Beitrag zur Kenntnis der geographischen Verbreitung der Mikrolepidopteren des paläarktischen Faunengebietes nebst Beschreibung neuer Formen, III. Teil. Deutsche Entomologische Zeitschrift Iris, Dresden 34(1–2): 75–179.

Caradja A, Meyrick E (1935) Materialien zu einer Mikrolepidopteren-Fauna der chinesischen Provinzen Kiangsu, Chekiang und Hunan. Entomologische Mitteilungen 11(2): 1–89.

Clarke JFG (1943) A new pest of *Albizzia* in the District of Columbia (Lepidoptera: Glyphipterigidae). Proceedings of the US National Museum 93(3162): 205–2008. https://doi.org/10.5479/si.00963801.93-3162.205

Clarke JFG (1967) The correct name for the Mimosa Webworm (Lepidoptera: Glyphipterigidae). Annals of the Entomological Society of America 61(1): 228–229. https://doi.org/10.1093/aesa/61.1.228

Common IFB (1990) Moths of Australia. Melbourne University Press, [VI +] 535 pp. https://doi.org/10.1071/9780643101227

Dugdale JS, Kristensen NP, Robinson GS, Scoble MJ (1998) The smaller Microlepidoptera-grade superfamilies. In: Kristensen NP (Ed.) Lepidoptera, Moths and Butterflies. Vol. 1, Evolution, Systematics and Biogeography. Handbook of Zoology, vol. 4(35), 217–232. [487 pp] https://doi.org/10.1515/9783110804744.217

Friese G (1960) Revision der paläarktischen Yponomeutidae unter besonderer Berücksichtigung der Genitalien. Beiträge zur Entomologie 10(1–2): 1–131.

Friese G (1962) Beitrag zur Kenntnis der ostpaläarktischen Yponomeutidae (Lepidoptera). Beiträge zur Entomologie 12(3–4): 299–331.

Friese G (1966) Ergebnisse der Albanien Expedition 1961 des Deutschen Entomologischen Instituts. 52. Beitrag. Lepidoptera: Plutellidae. Beiträge zur Entomologie 16: 447–459.

Heikkilä M, Mutanen M, Wahlberg N, Sihvonen P, Kaila L (2015) Elusive ditrysian phylogeny: an account of combining systematized morphology with molecular data (Lepidoptera). BioMed Central, Evolutionary Biology 15(260): 1–27. https://doi.org/10.1186/s12862-015-0520-0

Heppner JB (1998) Classification of Lepidoptera. Part 1. Introduction. Holarctic Lepidoptera 5, supplement 1, 148 pp.

Hirowatari T, Nasu J, Sakamaki J, Kishida J (2013) The standard of moths in Japan, III. Gakken Education Tokyo, 359 pp.

Holloway JD, Kibby G, Peggie D (2001) The families of Malesian moths and butterflies. Fauna Malesiana Handbook 3, Brill, Leiden, Boston, Köln, [XI +] 455 pp. https://doi.org/10.1163/9789004475595

Inoue H, Sugi S, Kuroko H, Moriuti S, Kawabe A (1982) Moth of Japan, vol.1, text, 966 pp., vol. 2, plates and synonymic catalogue, Tokyo, [392 pls] 552 pp.

Karsholt O, Razowski J [Eds] (1996) The Lepidoptera of Europe. A distributional checklist. Apollo Books, Stenstrup, 380 pp.

Knyazev SA, Ivonin VV, Vasilenko SV (2016) New and interesting findingsof butterflies and moths (Insecta, Lepidoptera) in Omsk and Novosibirsk Provinces. Amurian zoological journal 8(4): 254–272.

Kyrki J (1984) The Yponomeutoidea: a reassessment of the superfamily and its suprageneric groups (Lepidoptera). Entomologica Scandinavica 15: 71–84. https://doi.org/10.1163/187631284X00064

Kyrki J (1990) Tentative classification of holarctic Yponomeutoidea (Lepidoptera). Nota lepidopterologica 13(1): 28–42.

Lower OB (1899) Descriptions of new Australian Lepidoptera. Proceedings of the Linnaen Society of New South Wales 24: 83–116. https://doi.org/10.5962/bhl.part.7655

Minet J (1986) Ébauche d`une classification moderne de l`ordre des Lépidoptères. Alexanor 14(7): 291–313.

Mey W (2004) Galacticidae. In: Mey W (Ed.) The Lepidoptera of the Brandberg Massif in Namibia, part 1., Esperiana Memoir 1: 91–102.

Mey W (2007) The family Galacticidae in Yemen (Insecta, Lepidoptera, Ditrysia incertae sedis) with description of four new species. Esperiana Memoir 3: 333–339.

Mey W (2011) Basic pattern of Lepidoptera diversity in southwestern Africa. Esperiana Memoir 6, 320 pp.

Meyrick E (1914) Hyponomeutidae, Plutellidae, Amphitheridae. In: Wagner H (Ed.) Lepidopterologum Catalogus (W. Junk, Berlin) 19, 64 pp.

Meyrick E (1917–1922) Exotic Microlepidoptera 2. Taylor & Francis, London, 640 pp.

Meyrick E (1922) New Microlepidoptera of the German Entomological Institute. Entomologische Mitteilungen 11(2) : 44–47. https://doi.org/10.5962/bhl.part.3332

Meyrick E (1925) Descriptions of twenty-four new Egyptian Microlepidoptera. Bulletin de la Socité Royal Entomologique d`Egypt 9: 206–219.

Meyrick E (1930–1936) Exotic Microlepidoptera 4. Taylor & Francis, London, 642 pp.

Moriuti S (1963) Remarks on the *Paraprays anisocentra* (Meyrick, 1922) (Plutellidae) with descriptions of larva and pupa. Transactions of the Lepidopterological Society of Japan 14(3): 52–59.

Nielsen ES, Edwards ED (1996) Galacticidae. in Nielsen ES, Edwards ED, Rangsi TV (Eds) Checklist of the Lepidoptera of Australia.Monographs on Australian Lepidoptera, vol. 4, CSIRO Canberra, 43–43. [529 pp]

O'Reilly LJ, Harris BJ, Agassiz DJL, Holderied MW (2021) Convergent Evolution of Wingbeat-Powered Anti-Bat Ultrasound in the Microlepidoptera. Frontiers in Ecology and Evolution 9: e648223. https://doi.org/10.3389/fevo.2021.648223

Robinson GS (1976) The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. Entomologist`s Gazette 27: 127–132.

Rebel H (1910) Neue paläarktische Pyraliden, Tortriciden und Tineen. Deutsche Entomologische Zeitschrift Iris, Dresden 24(1): 1–14.

Regier JC, Mitter C, Zwick A, Bazinet AL, Cumming MP, Kawahara AY, Sohn J-C, Zwickl DJ, Cho S, Davis DR, Baixeras J, Brown J, Parr C, Weller S, Lees DC, Mitter KT (2013) A large-scale, higher-level, molecular phylogenetic study of the insect order lepidoptera (moths and butterflies). PLoS ONE 8: e58568. https://doi.org/10.1371/journal.pone.0058568

Sattler K (1967) Ethmiidae. In: Amsel HG, Gregor F, Reisser H (Eds) Microlepidoptera Palaearctica, zweiter Band, Teil 1, 185 pp.

Sinev SY (2008) Catalogue of the Lepidoptera of Russia. KMK Scientific Press Ltd., St. Petersburg-Moscow, 424 pp.

Stshetkin YL (1981) Higher Lepidoptera of the semideserts, adjacent mountains and higher mountains in the Vachsch valley (ecological-zoogeographical analysis). In: MN Narzikulov (Ed.) Entomologiceskoe obozreniye Tajikistana [Entomological revue of Tajikistan], Academy of Sciences of Tajikistan SSR, Dushanbe, 3–81. [216 pp]

Trofimova TA, Shovkoon DF, Nedoshivina SV (2017) Volga-Ural Lepidoptera described by A. Caradja from the collection of the «Grigore Antipa» National Museum of the Natural History (Romania, Bucharest). In: Anikin VV, Sachkov SA, Zolotuhin V (Eds) Fauna Lepidopterologica Volgo-Uralensis from P. Pallas to present days. Proceeding of the Museum Witt (Munich-Vilnius) 7, 451–456. [696 pp]

Turati E (1930) Novitá di Lepidotterologica in Cirenaica, III. Atti dela Società italiana di Scienze naturali, Milano 69(1): 46–92.

Walsingham Lord (1911) Algerian Microlepidoptera. The Entomologist`s monthly Magazine, second series 22: 12–15.